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(54) **TELEVISION RECEIVER AND ELECTRONIC DEVICE**

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(57) **ABSTRACT**

According to one embodiment, a television receiver includes: a housing; a circuit board; a flexible printed wiring board comprising a base layer, a conductive layer, and a protective layer. The circuit board is installed in the housing. The flexible printed wiring board is configured to be electrically connected to the circuit board. The base layer includes a first surface and a second surface positioned on an opposite side of the first surface. The conductive layer is provided on at least one of the first surface and the second surface of the base layer. The protective layer is configured to cover the base layer and the conductive layer, and includes an outer edge portion positioned on an outside of a periphery portion of the base layer.

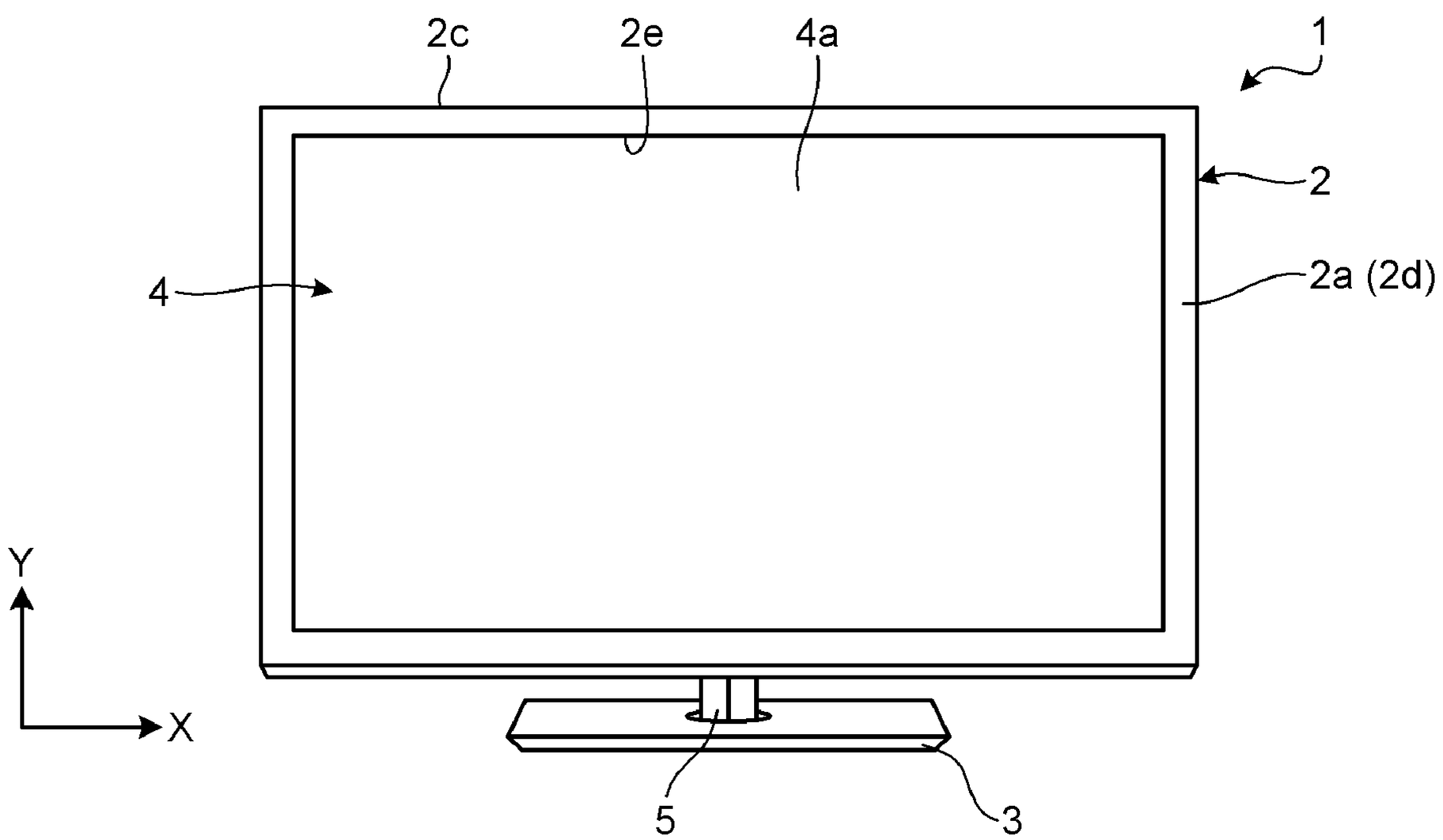


FIG.1

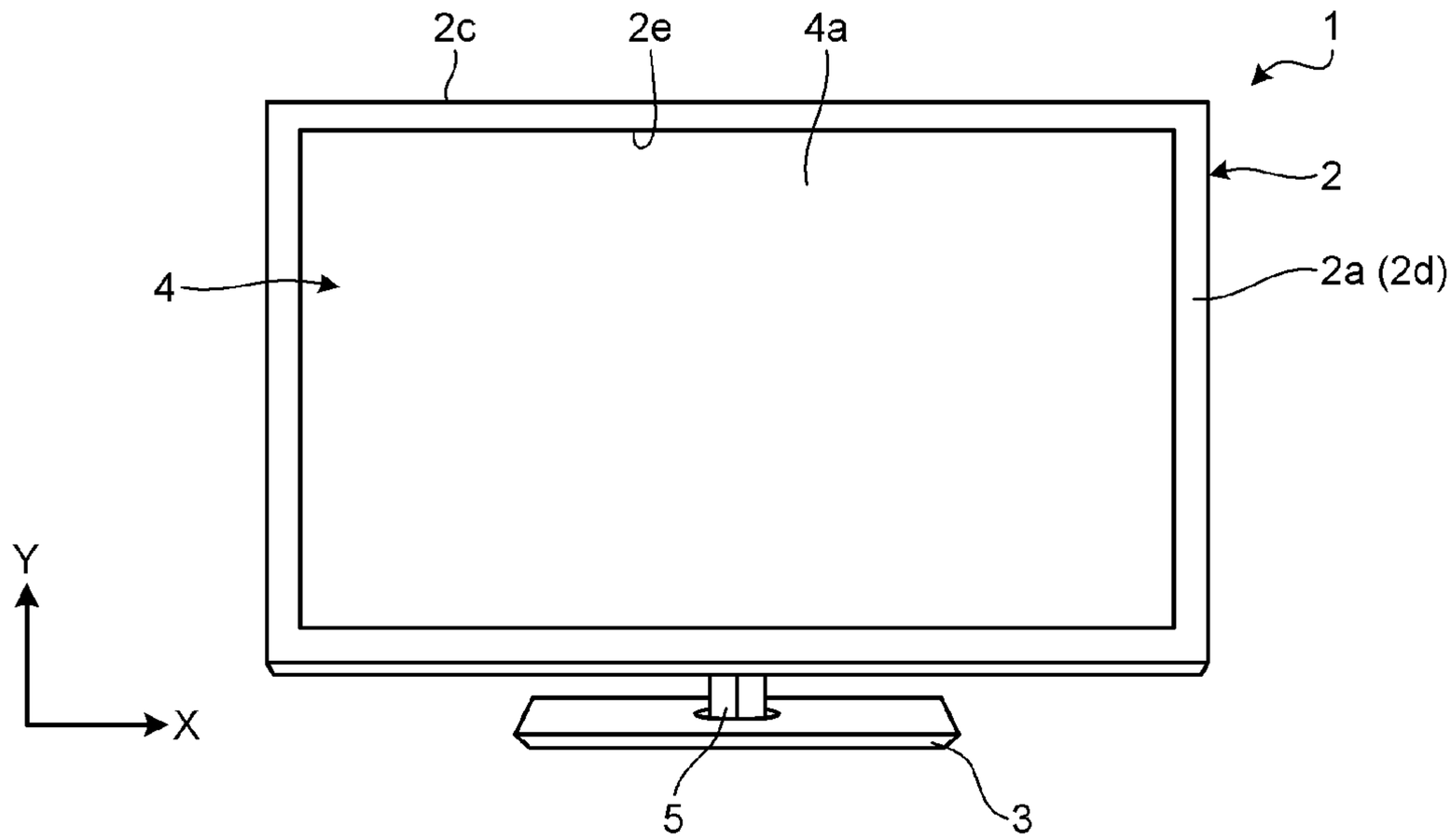


FIG.2

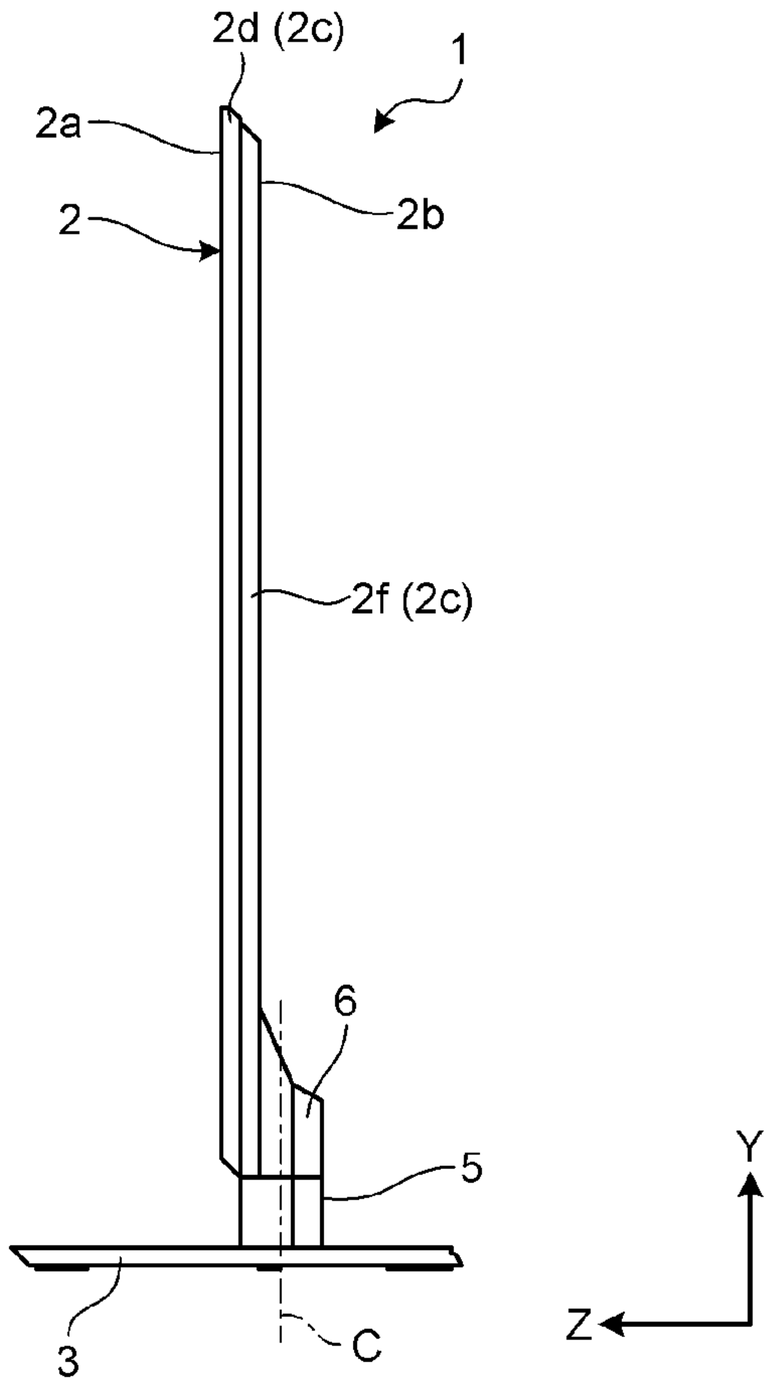


FIG.3

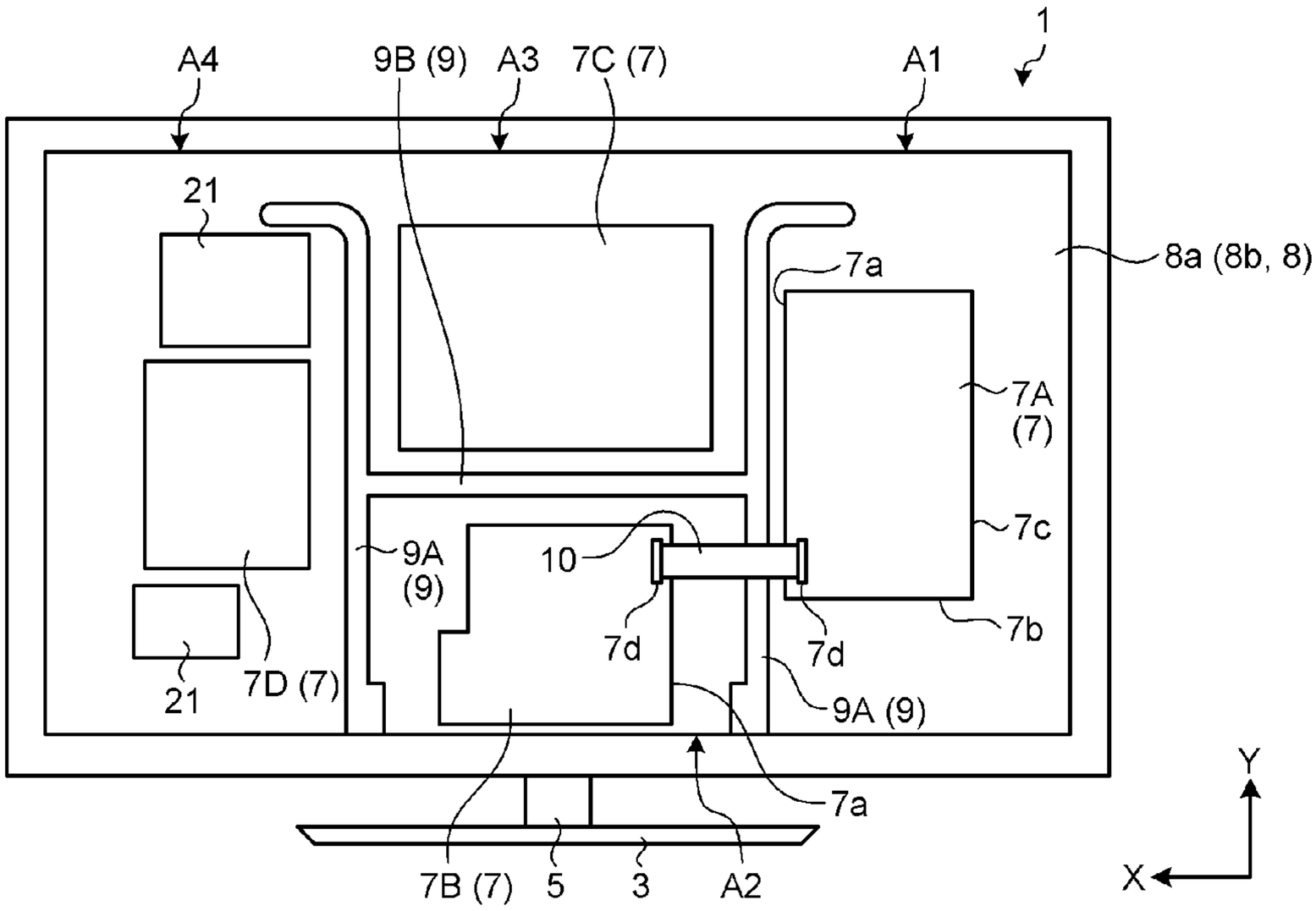

1
A4
9B (9)
A3
7C (7)
A1
21
8a (8b, 8)
7a
7A
(7)
7c
9A
(9)
10
7d
7d
7b
21
7D (7)
9A (9)
7a
7B (7)
5
3
A2
Y
X

FIG.4

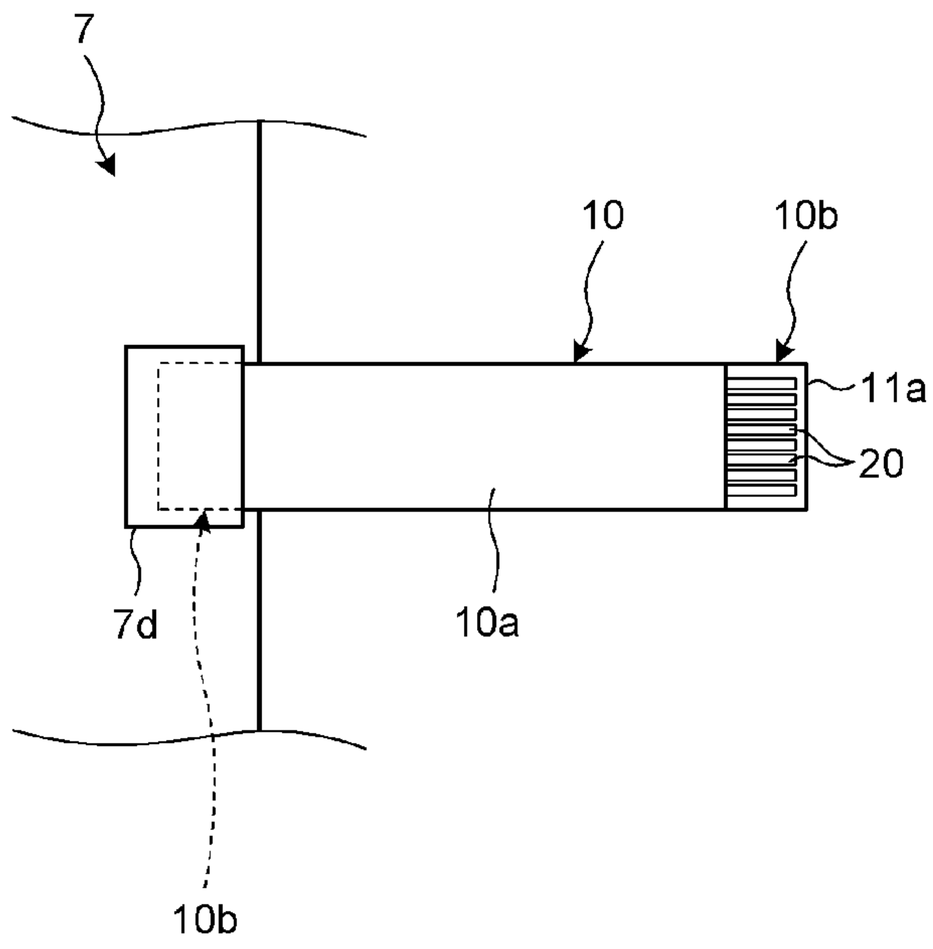

7
10
10b
11a
20
7d
10a
10b

FIG.5

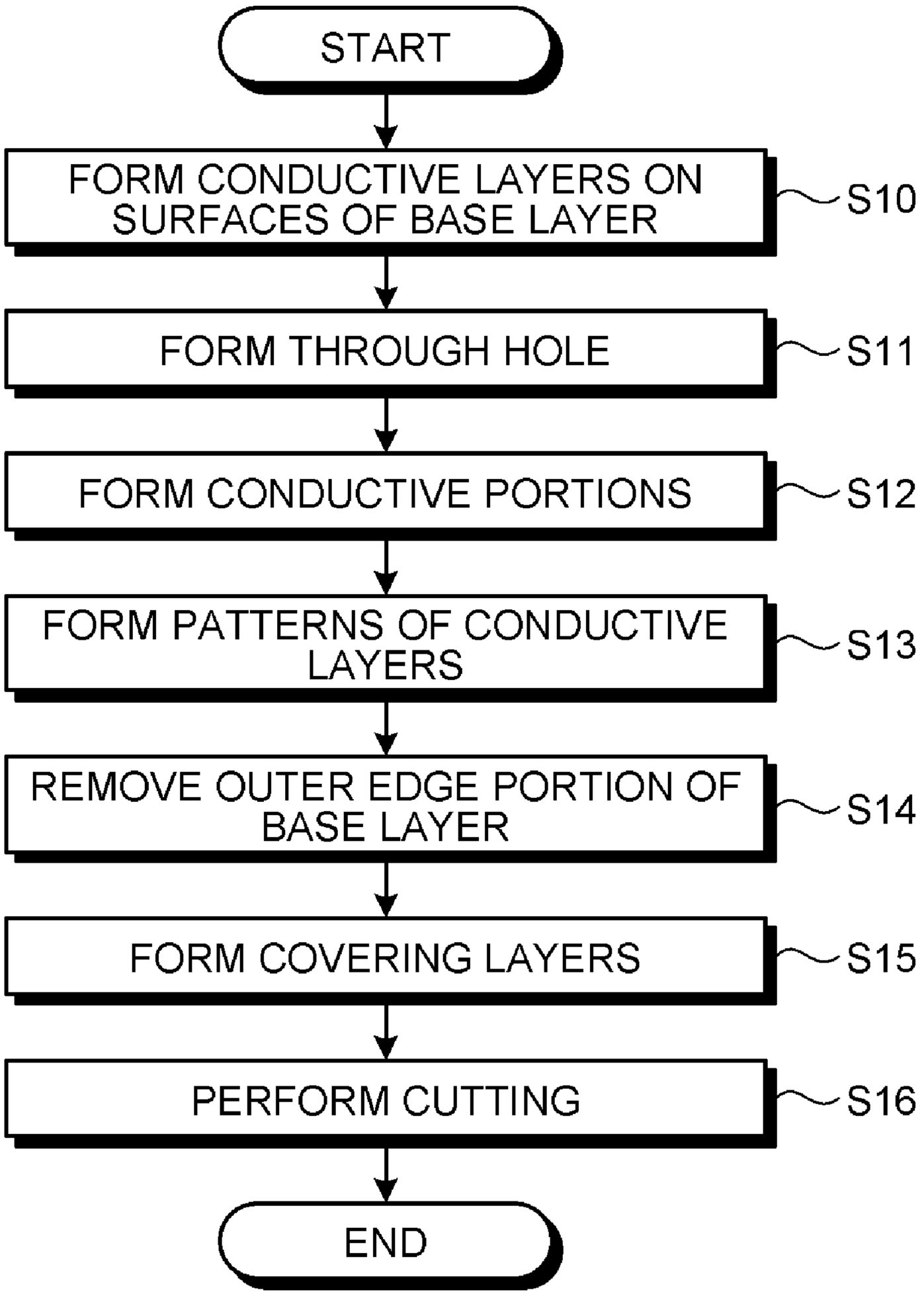

START
FORM CONDUCTIVE LAYERS ON SURFACES OF BASE LAYER
S10
FORM THROUGH HOLE
S11
FORM CONDUCTIVE PORTIONS
S12
FORM PATTERNS OF CONDUCTIVE LAYERS
S13
REMOVE OUTER EDGE PORTION OF BASE LAYER
S14
FORM COVERING LAYERS
S15
PERFORM CUTTING
S16
END

FIG.6

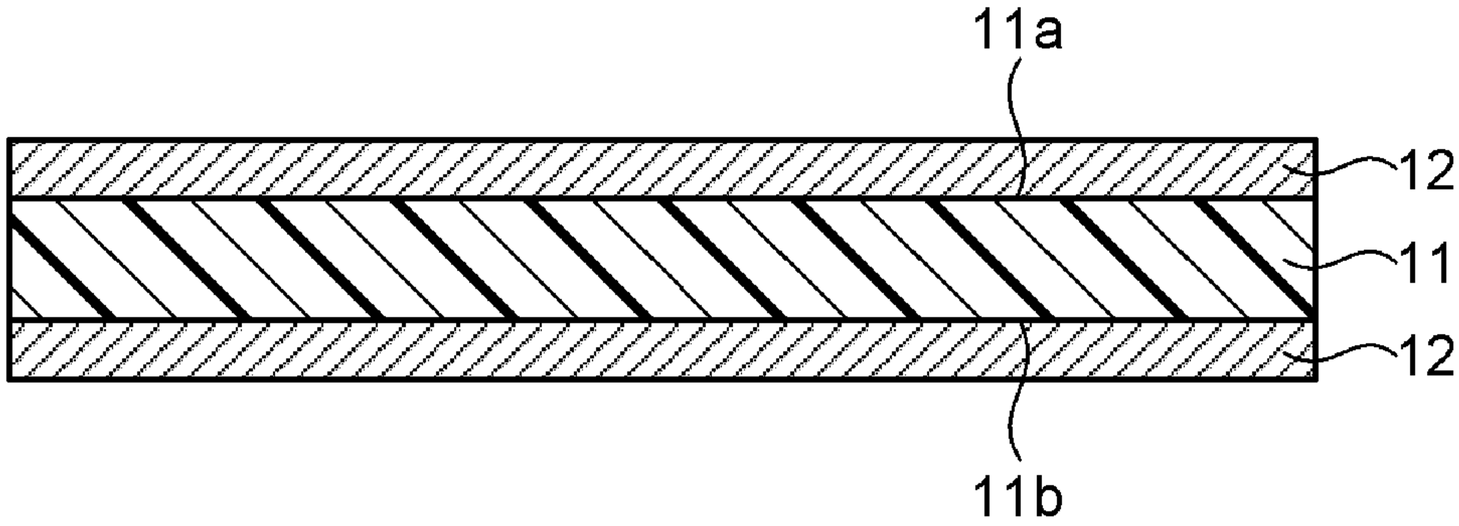


FIG.7

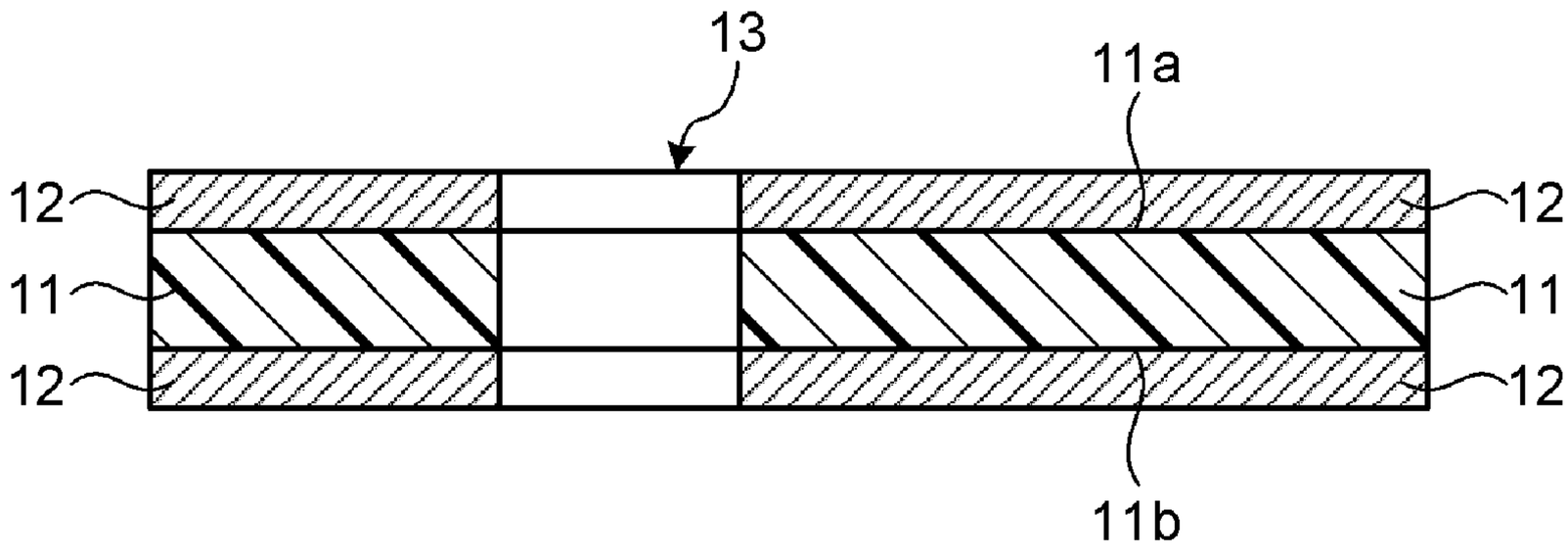


FIG.8

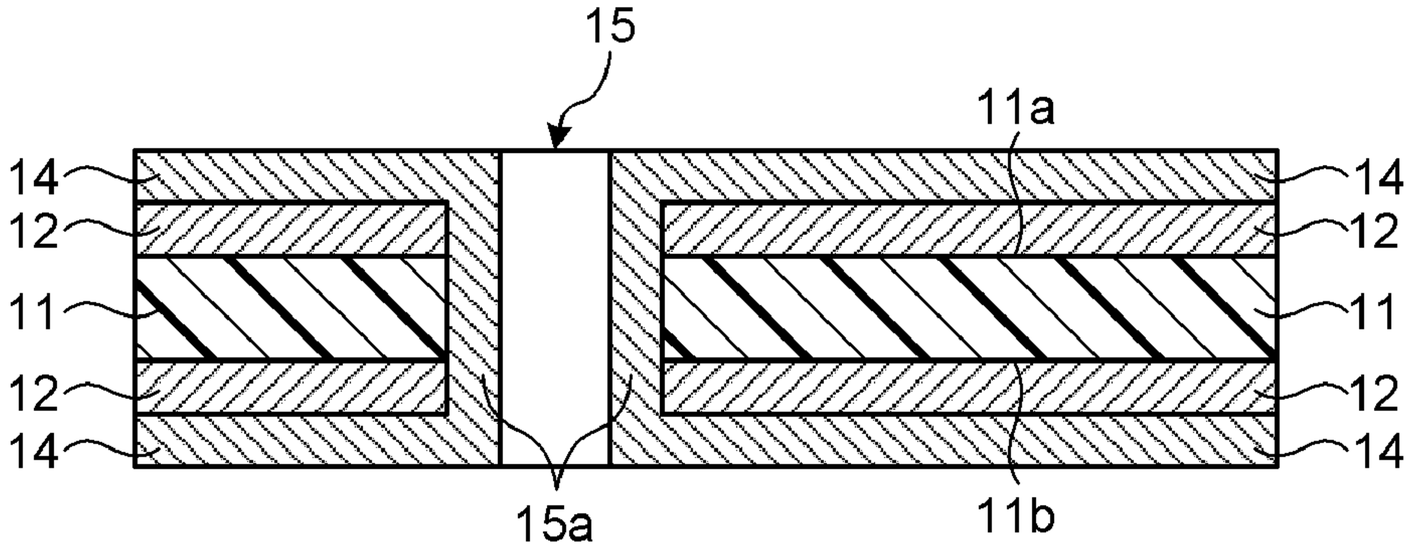

15
11a
14
12
11
12
14
14
12
11
12
14
15a
11b

FIG.9

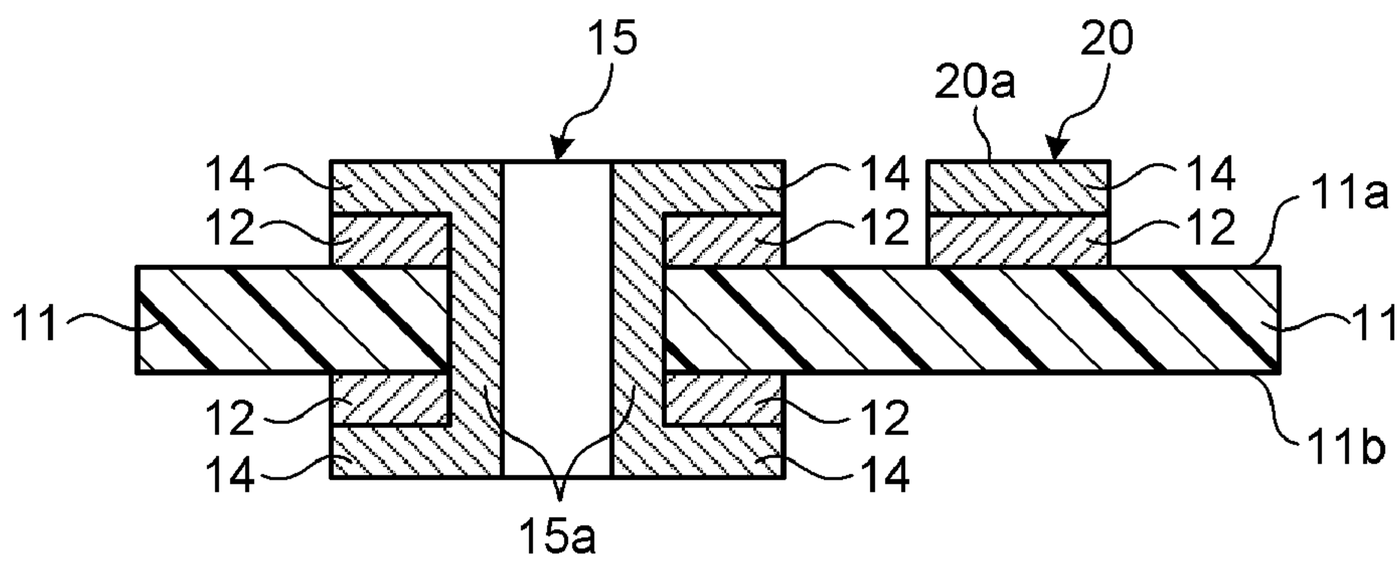

15
20
20a
14
12
11
12
14
14
12
11
12
14
14
12
11a
11
11b
15a

FIG.10

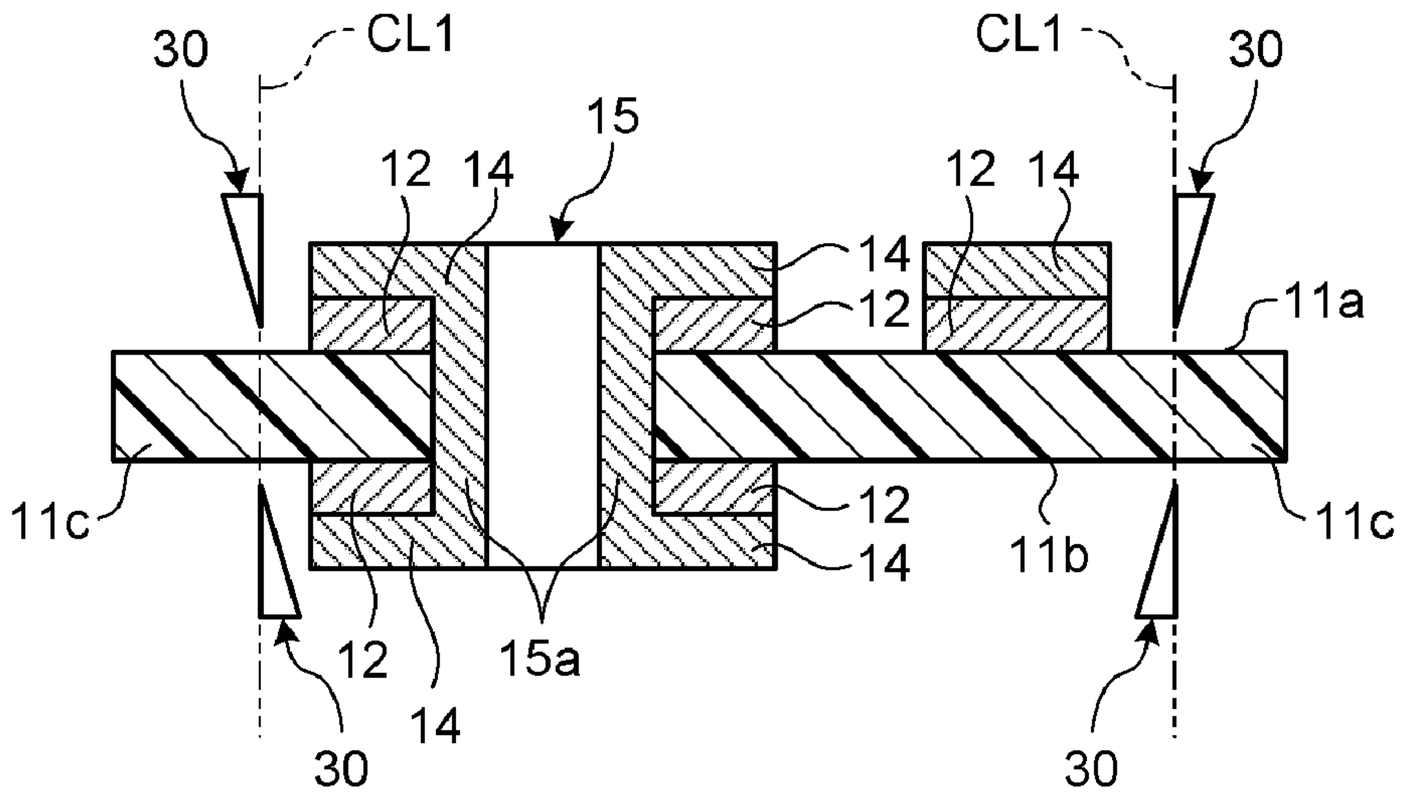

30
CL1
CL1
30
15
12 14
12 14
14
12
11a
11c
12
14
11b
11c
12
14
15a
30
30

FIG.11

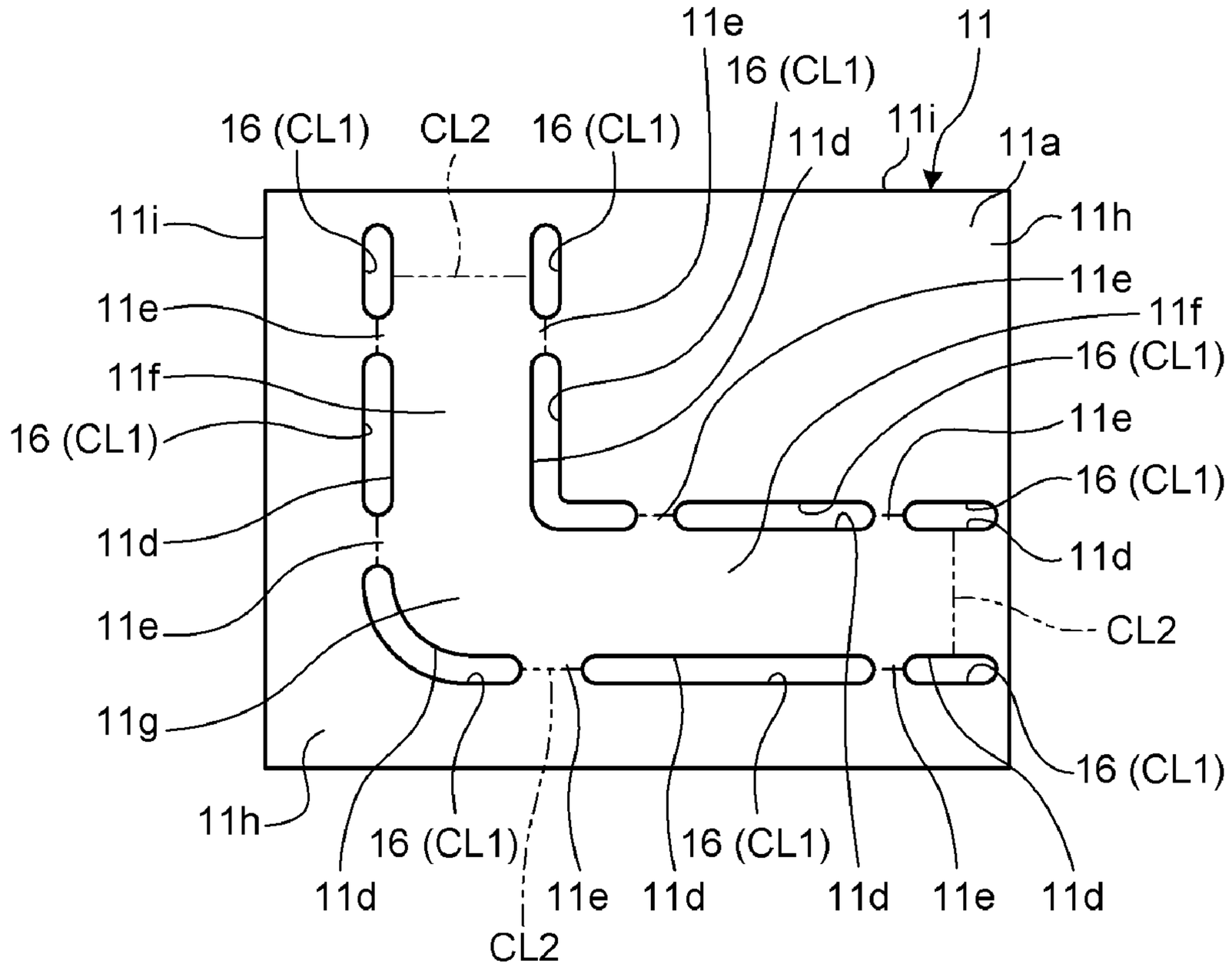

11e
11
16 (CL1)
16 (CL1)
CL2
16 (CL1)
11d
11i
11a
11i
11h
11e
11e
11f
11f
16 (CL1)
16 (CL1)
11e
16 (CL1)
11d
11d
CL2
11g
16 (CL1)
11h
16 (CL1)
16 (CL1)
11d
11e
11d
11d
11e
11d
CL2

FIG.12

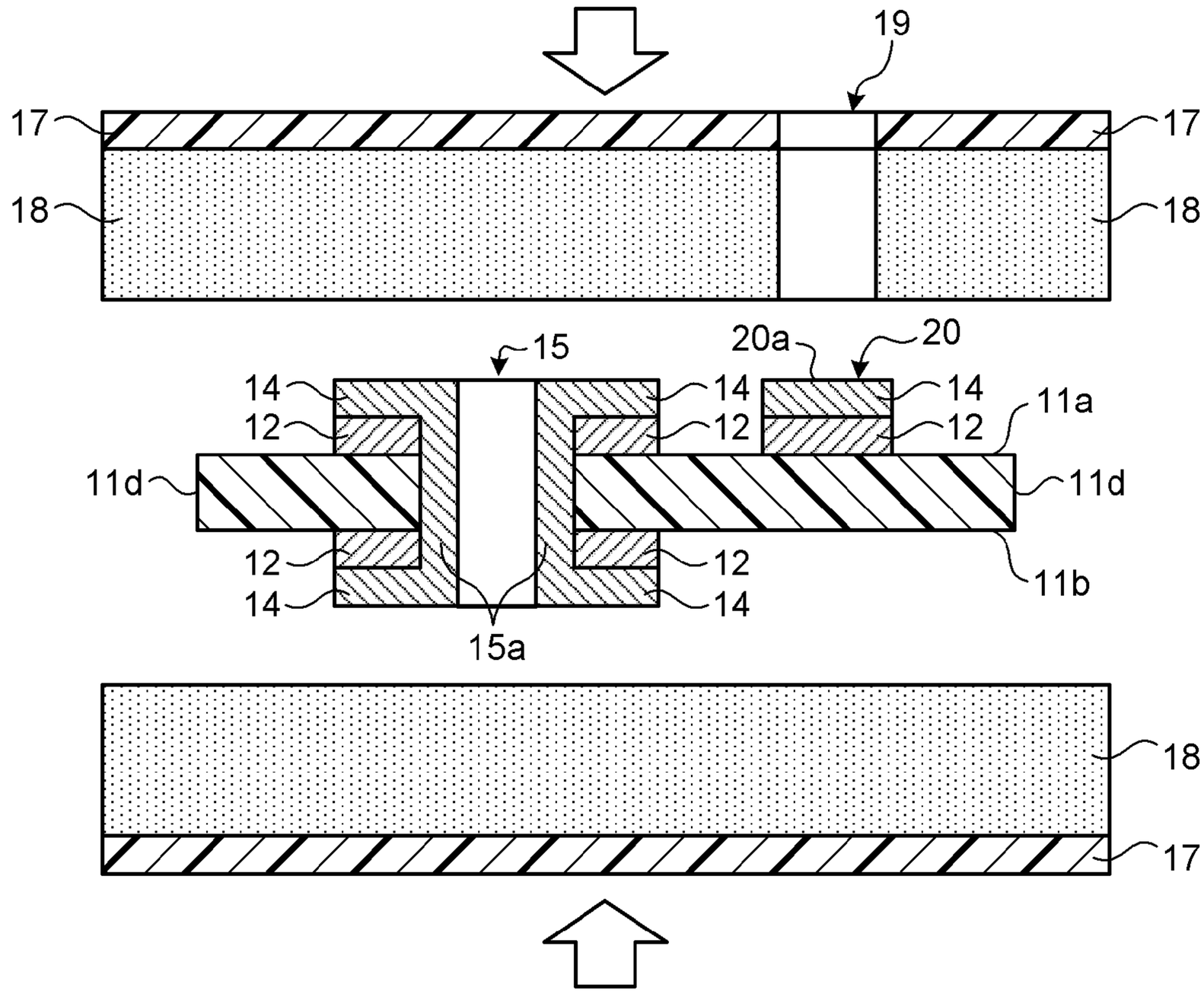

19
17
17
18
18
15
20a
20
14
14
14
11a
12
12
12
11d
11d
12
12
11b
14
14
15a
18
17

FIG.13

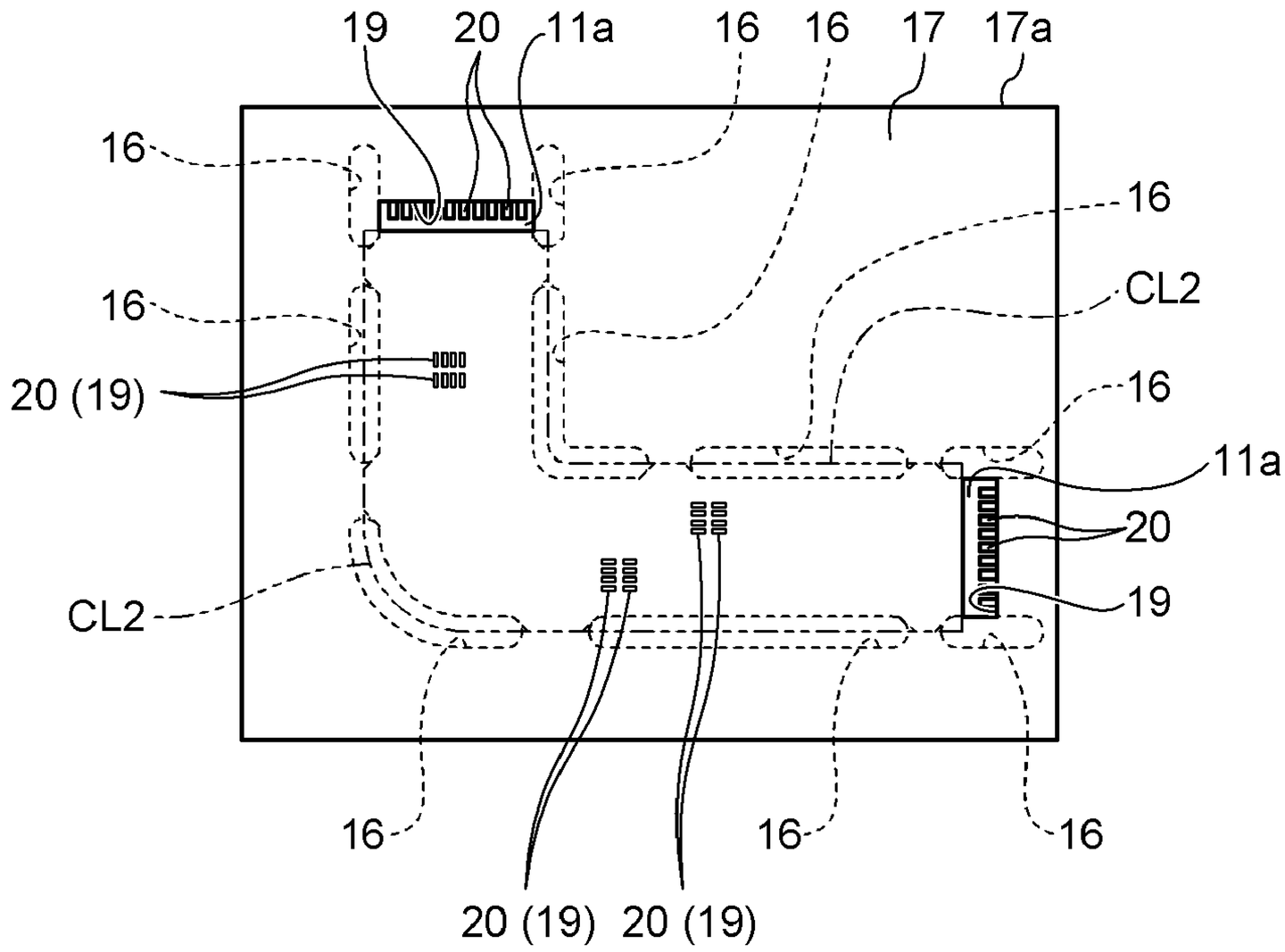

19
20
11a
16
16
17
17a
16
16
CL2
20 (19)
16
11a
20
19
CL2
16
16
16
20 (19)
20 (19)

FIG.14

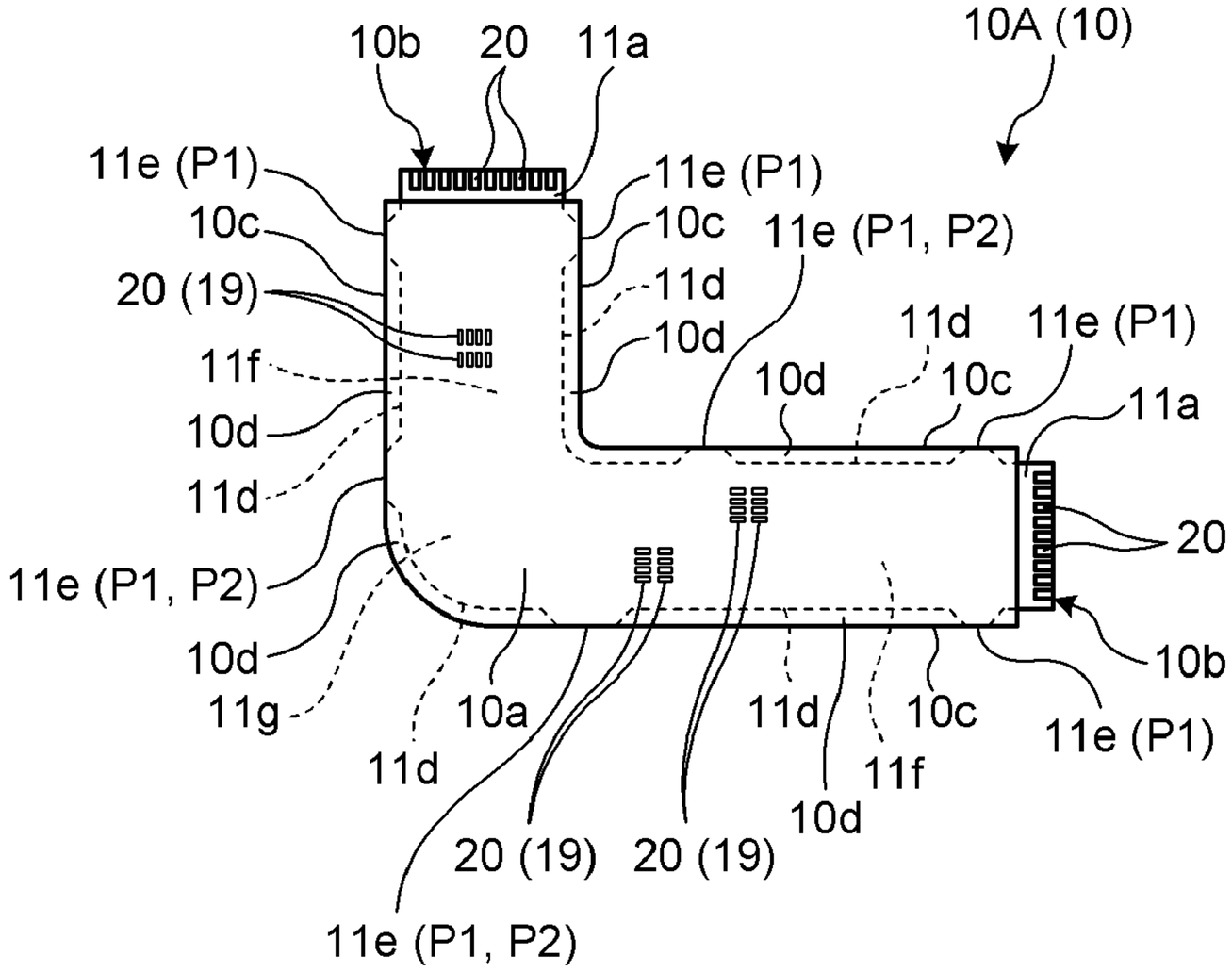

10b
20
11a
10A (10)
11e (P1)
11e (P1)
10c
10c
11e (P1, P2)
20 (19)
11d
10d
11d
11e (P1)
11f
10d
10c
10d
11a
11d
20
11e (P1, P2)
10b
10d
11g
10a
11d
11d
10c
11e (P1)
11f
10d
20 (19)
20 (19)
11e (P1, P2)

FIG.15

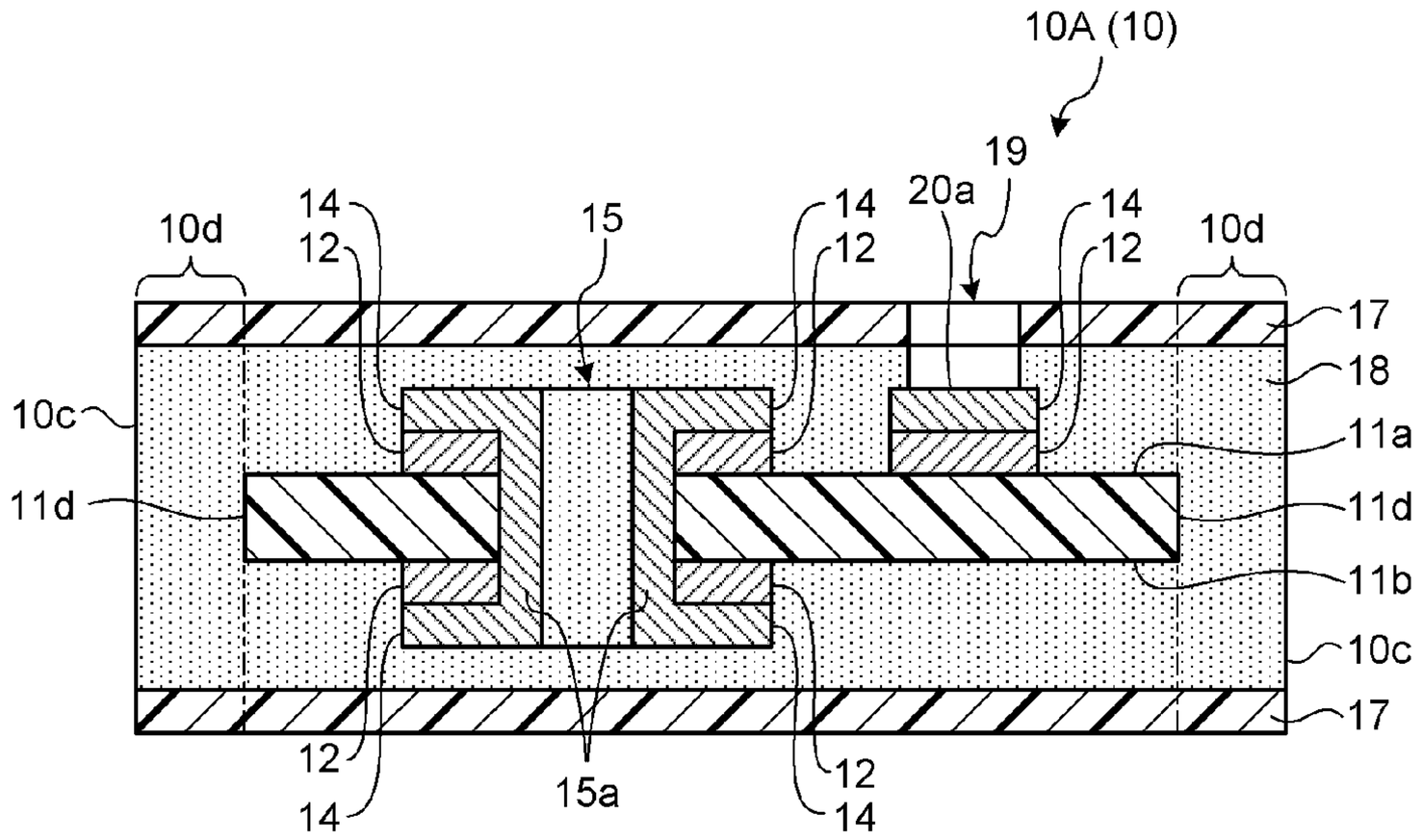

10A (10)
19
20a
10d
14
12
15
14
12
14
12
10d
17
18
10c
11a
11d
11d
11b
10c
17
12
14
15a
12
14

FIG.16

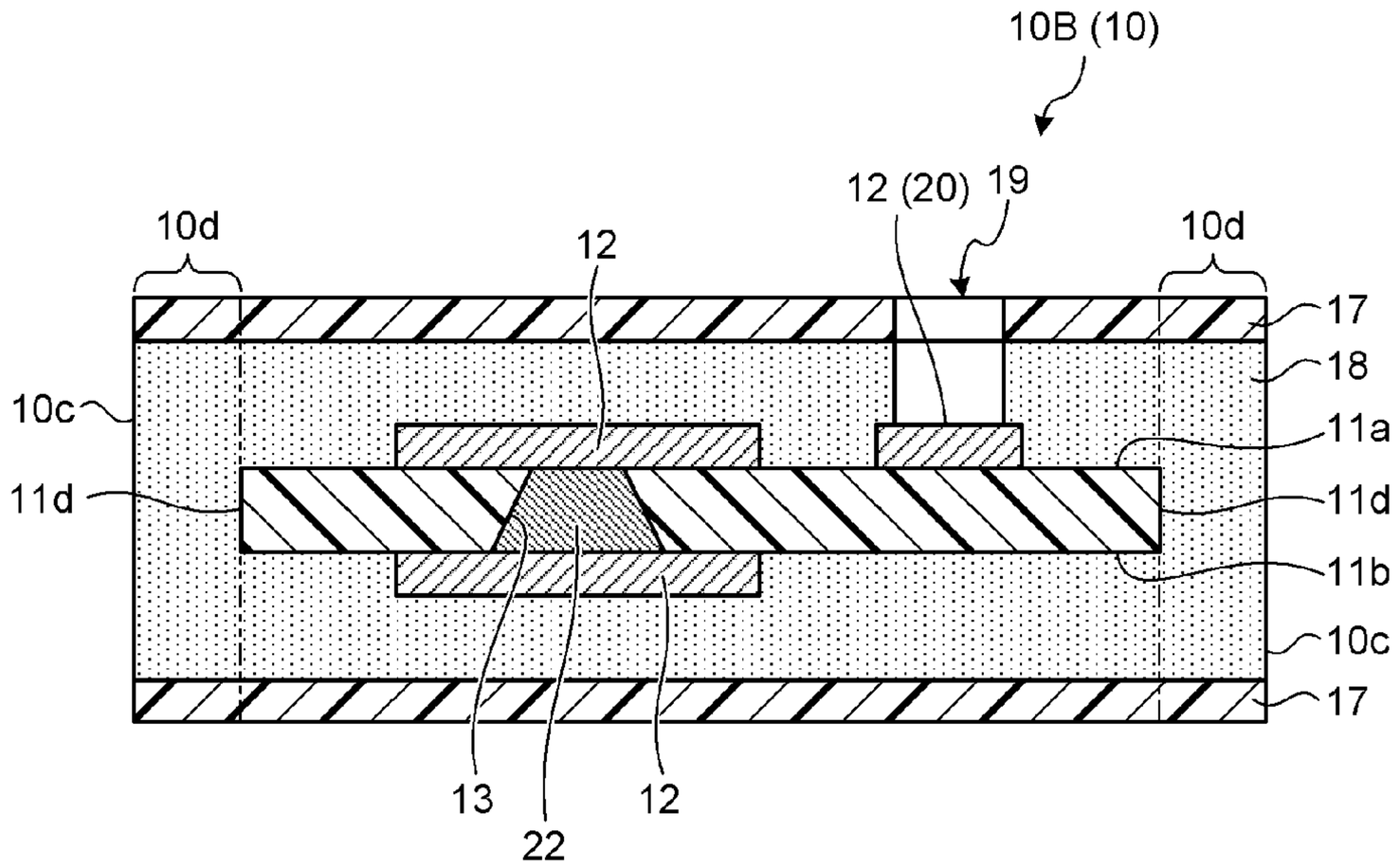
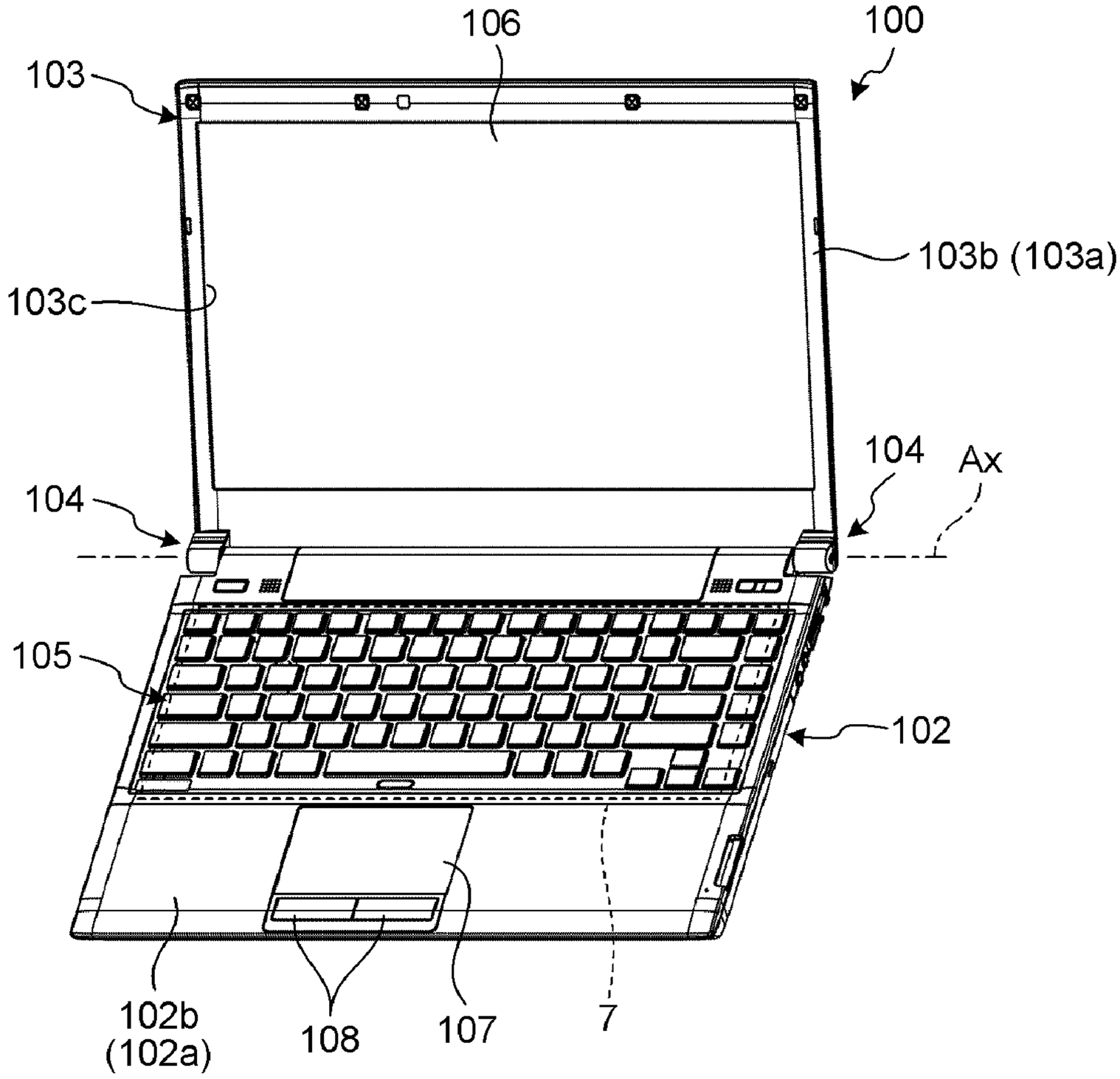

10B (10)
12 (20)
19
10d
12
10d
17
18
10c
11a
11d
11d
11b
10c
17
13
22
12

FIG.17


106
100
103
103b (103a)
103c
104
Ax
104
105
102
102b
(102a)
108
107
7

TELEVISION RECEIVER AND ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the benefit of priority from Japanese Patent Application No. 2011-080617, filed Mar. 31, 2011, the entire contents of which are incorporated herein by reference.

FIELD

[0002] Embodiments described herein relate generally to a television receiver and an electronic device.

BACKGROUND

[0003] Typically, flexible printed wiring boards comprising a base layer and a covering layer covering both sides of the base layer are known.

[0004] However, in case the base layer is made of a material having a comparatively low degree of toughness, the flexible printer-wiring board needs to be handled with more caution.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0005] A general architecture that implements the various features of the invention will now be described with reference to the drawings. The drawings and the associated descriptions are provided to illustrate embodiments of the invention and not to limit the scope of the invention.

[0006] FIG. **1** is an exemplary front view of a television receiver according to a first embodiment;

[0007] FIG. **2** is an exemplary side view of the television receiver in the first embodiment;

[0008] FIG. **3** is an exemplary rear view of an inside of the television receiver in the first embodiment;

[0009] FIG. **4** is an exemplary plan view of a flexible printed wiring board in the first embodiment;

[0010] FIG. **5** is an exemplary flowchart of a manufacturing method of the flexible printed wiring board in the first embodiment;

[0011] FIG. **6** is an exemplary schematic view (cross-sectional view) of a state in which conductive layers are formed on a base layer by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0012] FIG. **7** is an exemplary schematic view (cross-sectional view) of a state in which a through hole is formed in the configuration illustrated in FIG. **6** by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0013] FIG. **8** is an exemplary schematic view (cross-sectional view) of a state in which plating is performed on the configuration illustrated in FIG. **7** by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0014] FIG. **9** is an exemplary schematic view (cross-sectional view) of a state in which etching is performed on the configuration illustrated in FIG. **8** by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0015] FIG. **10** is an exemplary schematic view (cross-sectional view) of a state in which a first cutting is to be performed on the configuration illustrated in FIG. **9** by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0016] FIG. **11** is an exemplary schematic view (plan view) of the base layer obtained when the first cutting is performed on the configuration illustrated in FIG. **9** by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0017] FIG. **12** is an exemplary schematic view (cross-sectional view) of a state in which the configuration obtained through the first cutting as illustrated in FIG. **10** is covered by a protective layer by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0018] FIG. **13** is an exemplary schematic view (plan view) of a state in which the configuration obtained through the first cutting as illustrated in FIG. **10** is covered by the protective layer by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0019] FIG. **14** is an exemplary schematic view (plan view) of the flexible printed wiring board obtained when a second cutting is performed on the configuration comprising a protective layer as illustrated in FIG. **12** by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0020] FIG. **15** is an exemplary schematic view (cross-sectional view) of the flexible printed wiring board obtained when the second cutting is performed on the configuration comprising the protective layer as illustrated in FIG. **12** by the manufacturing method of the flexible printed wiring board, in the first embodiment;

[0021] FIG. **16** is an exemplary schematic view (cross-sectional view) of the flexible printed wiring board according to a modification of the first embodiment; and

[0022] FIG. **17** is an exemplary perspective view of an electronic device according to a second embodiment.

DETAILED DESCRIPTION

[0023] In general, according to one embodiment, a television receiver comprises: a housing; a circuit board; a flexible printed wiring board comprising a base layer, a conductive layer, and a protective layer. The circuit board is installed in the housing. The flexible printed wiring board is configured to be electrically connected to the circuit board. The base layer comprises a first surface and a second surface positioned on an opposite side of the first surface. The conductive layer is provided on at least one of the first surface and the second surface of the base layer. The protective layer is configured to cover the base layer and the conductive layer, and comprises an outer edge portion positioned on an outside of a periphery portion of the base layer.

[0024] In embodiments and modifications described below, identical constituent elements are referred to by the same reference numerals and explanations thereof are given only once without repetition. Moreover, with reference to some of the drawings, directions are defined for the sake of simplicity. More particularly, in a television receiver **1** corresponding to an electronic device, the right-hand direction in the front view (i.e., the left-hand direction in the rear view) of a display screen **4***a* is assumed to be the X direction, the upward direction is assumed to be the Y direction, and the direction normal to the display screen **4***a* is assumed to be the Z direction.

[0025] As illustrated in FIGS. **1** and **2**, the television receiver **1** according to a first embodiment comprises a platform **3** and a rectangular, flat and comparatively thin main

body **2** that is supported on the platform **3** via a leg **5** and a junction **6**. In the main body **2**, a rectangular opening **2***e* is formed on a front face **2***a* of a housing **2***c*. From the opening **2***e*, there is exposed the display screen **4***a* of a display **4** (display unit **8**) that is housed in the housing **2***c*. Herein, the display **4** is a panel (panel unit) such as a liquid crystal display (LCD) or an organic electroluminescent display (OELD). Moreover, the display **4** is an example of a display device, a display module, a module, or a panel.

[0026] The housing **2***c* is configured by, for example, fitting together components such as a front mask **2***d* on a side of the front face **2***a* and a rear cover **2***f* on a side of a rear face **2***b*. The junction **6** protrudes rearward from the rear face **2***b* and is supported at the leg **5** in a rotatable manner around an axis of rotation C. The front mask **2***d* partially constitutes the front wall and the side wall (peripheral wall, upstand wall). Similarly, the rear cover **2***f* partially constitutes the rear wall and the side walls. The front wall, the side wall, and the rear wall constitute the wall portion. Meanwhile, as illustrated in FIG. **1**, the housing **2***c* has four corners.

[0027] In the embodiment, as illustrated in FIG. **3**, a plurality of circuit boards **7** (such as circuit boards **7**A to **7**D) are attached on a rear face **8***a* of the display unit **8** (i.e., on the face opposite to the display screen **4***a*), which comprises the display **4**, with the use of fastening members such as screws (not illustrated). More particularly, the circuit boards **7** are fixed on a boss portion (not illustrated) that is formed in a protruding manner on the rear face **8***a*. Hence, there exists a clearance gap between the circuit boards **7** and the rear face **8***a*.

[0028] On a back plate **8***b* that serves as the wall constituting the rear face **8***a* of the display unit **8**, ribs **9** (**9**A and **9**B) are arranged in a substantially H-shaped manner (as viewed in a line of sight of FIG. **3**). The ribs **9** (**9**A and **9**B) protrude from the rear face **8***a*. Moreover, the ribs **9**A (first-type ribs) are arranged spaced apart from each other and parallel to each other at the center of the back plate **8***b* in the horizontal direction, and extended in the vertical direction. The rib **9**B (second-type rib) is horizontally extended and arranged as a bridge between the ribs **9**A at the center in the vertical direction of the ribs **9**A. The ribs **9**A and **9**B are structural strengthening members (reinforcing members or framework members) of the display unit **8**. The ribs **9**A and **9**B can be configured by partially pressing the back plate **8***b*, or by adding a different member, or by partially pressing the back plate **8***b* and then adding a different member. Meanwhile, on the ribs **9** (e.g., on the ribs **9**A), a fastening portion (such as a boss portion or a screw hole, not illustrated) is formed for VESA (registered trademark) mounting purpose, that is, for wall-hanging purpose.

[0029] In the first embodiment, as illustrated in FIG. **3**, due to the ribs **9**A and **9**B arranged in a substantially H-shaped manner, the rear face **8***a* of the display unit **8** is partitioned in following four areas when viewed from behind: a first area A**1** formed on the right side of the right-hand side rib **9**A; a second area A**2** formed below the rib **9**B at the center in the horizontal direction; a third region A**3** formed above the rib **9**B; and a fourth area A**4** formed on the left side of the left-hand side rib **9**A. Among the areas A**1** to A**4**, various circuit boards **7** (such as circuit boards **7**A to **7**D, a substrate, a printed circuit board, a printed wiring board, an interconnection substrate, a rigid substrate, and the like) or a component **21** are arranged in a suitably dispersed manner.

[0030] For example, in the first embodiment, the circuit board **7**A (first circuit board) is disposed in the first area A**1**; the circuit board **7**B (second circuit board) is disposed in the second area A**2**; the circuit board **7**C (third circuit board) is disposed in the third area A**3**; and the circuit board **7**D (fourth circuit board) is disposed in the fourth area A**4**. Moreover, in the fourth area A**4** is also disposed the component **21** (a module such as a hard disk drive or a speaker). Besides, each circuit board is covered with a shield case (not illustrated).

[0031] On the circuit boards **7**, it is possible to configure (mount) various circuits such as an input signal processing circuit, a frame rate converter (FRC) circuit, a timing control (Tcon) circuit, and a driver circuit (XY driver).

[0032] The input signal processing circuit comprises a tuner (not illustrated) or a connector (not illustrated), and processes signals received from a component such as an antenna or from an audio visual (AV) device and outputs image (video) data and sound (audio) data. Besides, the input signal processing circuit can also perform various operations such as image processing, correction, and video composition.

[0033] The frame rate converter circuit receives the video data from the input signal processing circuit and, for example, performs frame rate conversion of the video by generating interpolation frames from the motion vectors of the video. Besides, the frame rate converter circuit can also perform operations for generating three-dimensional (3-D) graphics or operations for achieving high definition. As compared to the transmission quantity per unit time of the video data fed to the frame rate converter circuit, the video data output from the frame rate converter circuit has an increased transmission quantity per unit time.

[0034] Upon receiving the video data from the frame rate converter circuit, the timing control circuit generates timing signals for controlling the driver circuit that is mounted at the subsequent stage, and outputs the video data and the timing signals.

[0035] On the basis of the timing signals received from the timing control circuit, the driver circuit drives the display **4** so as to display predetermined video on the display **4**.

[0036] In the first embodiment, for example, the input signal processing circuit is mounted on the circuit board **7**A, while the frame rate converter circuit and the timing control circuit are mounted on the circuit board **7**B. In that case, as illustrated in FIG. **3**, the circuit boards **7**A and **7**B are positioned in such a manner that the right-hand side rib **9**A is sandwiched between the circuit boards **7**A and **7**B.

[0037] Moreover, in the first embodiment, for example, the circuit boards **7**A and **7**B are electrically connected via a flexible printed wiring board **10** (a flexible printed wiring assembly, a flexible wiring assembly, a flexible printed circuit (FPC)) as illustrated in FIG. **3**. As described above, one of the ribs **9**A that is positioned between the circuit boards **7**A and **7**B protrudes rearward. Consequently, as compared to the region not having the ribs **9**; the back plate **8***b*, which serves as the wall, and the rear cover **2***f*, which serves as the rear wall of the housing **2***c* (see FIG. **2**), have a smaller clearance gap therebetween. In the present embodiment, the data transmission quantity between the circuit boards **7**A and **7**B is comparatively smaller at a stage prior to being increased by the frame rate converter circuit. Hence, the flexible printed wiring board **10** can be used as a cable for electrically connecting the circuit boards **7**A and **7**B. Thus, in the first embodiment, it becomes possible to prevent the cable (number or thickness) to be an obstacle in achieving downsizing or in improving resistance properties or strength. Besides, as compared to a configuration in which the circuit boards are electrically

connected by a number of twisted pair cables, it becomes possible to reduce the time and effort as well as the cost of manufacturing.

[0038] In the circuit board **7**A, a plurality of connectors (connectors for external connections, not illustrated) are disposed along edges of the circuit board **7**A (periphery portions, for example, edges **7***b* and **7***c*). In case of a configuration in which the connectors are exposed from the clearance gap (opening) between the rear cover **2***f* and the back plate **8***b,* positioning of the circuit board **7**A in the first area A**1** makes it easier for the edges (periphery portions, for example, edges **7***b* and **7***c*) of the circuit board **7**A to lie along the periphery portion of the back plate **8***b.* As a result, it becomes easier to form the clearance gap (opening).

[0039] As illustrated in FIG. **4**, the flexible printed wiring board **10** is of a predetermined width and extends in a belt-like manner. Moreover, the flexible printed wiring board **10** has an extended portion **10***a* and has edge portions **10***b* in the longitudinal direction of the extended portion **10***a*. Each edge portion **10***b* is configured to be a connector having a terminal **20** (terminal member, connection terminal, contact, contact member, conductor) being exposed therefrom. As also illustrated in FIG. **3**, the edge portions **10***b* are coupled (connected) by insertion to connectors **7***d,* each of which is disposed adjacent to an edge **7***a* of one of the circuit boards **7** (**7**A or **7**B). When the terminals **20** at the edge portions **10***b* make contact with terminals (not illustrated) at the connectors **7***d,* electricity starts flowing therebetween and the conductor in the circuit board **7**A is electrically connected to the conductor in the circuit board **7**B via the terminals **20** and via internal conductive layers **12** and **14** (conductor layer, see FIG. **15**) that are formed on the flexible printed wiring board **10**.

[0040] FIG. **5** is a flowchart for explaining an example of a manufacturing method of a flexible printed wiring board **10**A (**10**) illustrated in FIGS. **6** to **15**. The flexible printed wiring board **10**A is an L-shaped board in planar view. Herein, FIGS. **6** to **15** are schematic views (cross-sectional views or plan views) of the flexible printed wiring board **10**A at each step of the manufacturing method. The flexible printed wiring board **10**A, illustrated in FIGS. **6** to **15**, can also be mounted in the television receiver **1**. Moreover, the flexible printed wiring board **10**A is only an example, and the manufacturing method illustrated in FIGS. **5** to **15** can also be implemented to manufacture the flexible printed wiring board **10** of other shapes.

[0041] Firstly, as illustrated in FIG. **6**, the conductive layers **12** (a conductor layer, a wiring layer, a second layer, a second portion, or a second area) are formed on a first surface **11***a* and a second surface **11***b* of a base layer **11** (a base portion, a first layer, a first portion, or a first area), respectively (S**10** in FIG. **5**, forming of the conductive layers).

[0042] The base layer **11** is an example of an intermediate layer, an inner layer, an insulating layer, or a lower layer. The base layer **11** is made of, for example, prepreg, which has a sheet-like flexible structure manufactured by impregnating uncured resin material (such as thermosetting resin or epoxy resin) in a fiber such as carbon fiber, glass fiber, or aramid fiber. As compared to a synthetic resin material such as polyimide or polyethylene terephthalate, prepreg is inexpensive but has a lower degree of toughness and tears easily.

[0043] The conductive layers **12** are, for example, a copper foil that is laid on surfaces (the first surface **11***a* and the second surface **11***b*), respectively, of the base layer **11** by coating, sputtering, evaporation coating, or adhesion.

[0044] Subsequently, as illustrated in FIG. **7**, a through hole **13** is formed by, for example, punching at a predetermined position in the configuration illustrated in FIG. **6** (S**11** in FIG. **5**, forming of the through hole). At S**11**, the through hole **13** penetrates the base layer **11** and the conductive layers **12** formed on the surfaces of the base layer **11** in a width direction (vertical direction in FIG. **7**).

[0045] Then, as illustrated in FIG. **8**, either only a portion including the through hole **13** or the entire portion of the configuration illustrated in FIG. **7** is subjected to, for example, plating. That results in the formation of the conductive layers **14**, which cover both sides of the configuration illustrated in FIG. **7**. Because of the plating, a plated through hole **15** is formed with conductive portions **15***a* so that the conductive layers **12** and **14** on the side of the first surface **11***a* are electrically connected to the conductive layers **12** and **14** on the side of the second surface **11***b* (S**12** in FIG. **5**, forming of the conductive portion).

[0046] Subsequently, as illustrated in FIG. **9**, for example, etching is performed on the conductive layers **12** and **14**, which are formed on the surfaces of the base layer **11** (the first surface **11***a* and the second surface **11***b*) in the configuration illustrated in FIG. **8**. That results in the formation of the patterns of the conductive layers **12** and **14** (conductor patterns, wiring patterns, wiring) (S**13** in FIG. **5**, forming of the conductive layer pattern).

[0047] Then, as illustrated in FIG. **10**, for example, a cutting device or a cutting tool such as a cutter **30** or a punch (not illustrated) is used to cut the configuration illustrated FIG. **9** along first cutting lines CL**1**. That results in the removal of outer edge portions **11***c* (portions equivalent to the outer edge portions of the flexible printed wiring board **10**) of the base layer **11** (S**14** in FIG. **5**, removing of the outer edge portion of the base layer).

[0048] As illustrated in FIG. **11**, for example, midway through the manufacturing process, the base layer **11** has a rectangular outer edge **11***i.* At S**14**, for example, elongated openings **16** are formed on the base layer **11**. Due to the openings **16**, the flexible printed wiring board **10**A is divided into an available area (having extended portions **11***f* and a curved portion **11***g*) and a redundant area **11***h* (unused portion, surplus portion, or removable portion). In the available area, for example, the extended portions **11***f* extend in a linear fashion (belt-like fashion) and the curved portion **11***g* is curved in an arc-like fashion. The extended portions **11***f* and the curved portion **11***g* run along the first surface **11***a* and the second surface **11***b* (see FIG. **10**). Meanwhile, the openings **16** constitute outer edge portion **11***d* (periphery portions, periphery) in the width direction (lateral direction) of the extended portions **11***f* and the curved portion **11***g*. Moreover, in the example illustrated in FIG. **11**, the openings **16** are formed in plurality and are spaced apart from each other along the side edges of the available area (the extended portions **11***f* and the curved portion **11***g*). Thus, at the intervals in between the openings **16**, the available area (the extended portions **11***f* and the curved portion **11***g*) is attached to the redundant area **11***h*. Meanwhile, although the openings **16** are illustrated to be through holes in FIG. **11**, it is also possible to form the openings **16** as notches.

[0049] Subsequently, as illustrated in FIG. **12**, covering layers **17** (covering portions, covering layers, outer layers, upper layers, third layers, third portions, or third areas) are formed (pasted or attached) on the first surface **11***a* and the second surface **11***b* of the base layer **11** via adhesive layers **18**

(adhesive portions, joining portions, connection layers, fourth layers, fourth portions, or fourth areas) (S**15** in FIG. **15**, covering-layer-forming), respectively. The covering layers **17** are examples of covering layers, protective layers, or insulating layers. One of the covering layers **17** formed on the first surface **11***a* is an example of a first protective layer (first covering layer), while other one of the covering layers **17** formed on the second surface **11***b* is an example of a second protective layer (second covering layer). The covering layers **17** can be made from, for example, an engineering plastic film (synthetic resin material) of polyimide (PI), polyethylene terephthalate (PET), liquid crystal polymer (LCP), or the like.

[0050] As illustrated in FIG. **12**, at a position of the covering layers **17** and the adhesive layers **18** corresponding to at least one of the conductive layers **12** and **14**, an opening **19** (an exposed opening or an aperture) is formed as for example a through hole or a notch. The conductive layers **12** and **14** corresponding to the opening **19** are an example of the terminal **20** (terminal member, connection terminal, contact, contact member, conductor). The surface of the conductive layer **12** or the conductive layer **14** (as an example in the first embodiment, the surface of the conductive layer **12**) represents a contact surface **20***a* (a facing surface or an exposed surface).

[0051] FIG. **13** illustrates a configuration in which the base layer **11** is covered by the covering layers **17**. As illustrated in FIG. **13**, midway through the manufacturing process, for example, the covering layer **17** has a rectangular outer edge **17***a* corresponding to (consistent to) the base layer **11** illustrated in FIG. **11**. Thus, at S**15**, as illustrated in FIGS. **10** and **11**, the positioning of the covering layers **17** can be done by the overlapping of the outer edge **11***i* of the base layer **11** and the outer edge **17***a* of the covering layer **17**. Meanwhile, overlapping of the outer edges **11***i* and **17***a* is only an example and, other than making use of the outer edges **11***i* and **17***a,* it is also possible to have a positioning mechanism (such as an aligned through hole) in the base layer **11** and the covering layer **17**.

[0052] Subsequently, the configuration illustrated in FIG. **13**, that is, the configuration in which the base layer **11** is covered from both sides by the covering layers **17** is cut along second cutting lines CL**2** using a cutting tool such as a cutter (not illustrated) or a cutting device (not illustrated). As a result, the redundant area is removed and the flexible printed wiring board **10**A illustrated in FIGS. **14** and **15** is obtained (S**16** in FIG. **16**, cutting). As illustrated in FIG. **13**, the second cutting lines CL**2** pass through the openings **16** that are formed on the base layer **11**. Hence, as illustrated in FIGS. **14** and **15**, in the area in which the openings **16** are formed, the outer edges **11***d* of the base layer **11** recede in the width direction as compared to side edges **10***c* (outer edges) of the flexible printed wiring board **10**A defined by the second cutting lines CL**2**. As a result, as illustrated in FIG. **15**, outer edge portions **10***d* of the covering layers **17** and the adhesive layers **18** are formed on the outside of the outer edges **11***d* of the base layer **11**. Hence, according to the first embodiment, if the base layer **11** is made of a material such as prepreg having a comparatively lower degree of toughness; then it is possible to form such a region in the flexible printed wiring board **10**A in which the outer edges **11***d* of the base layer **11** are not exposed at the side edges **10***c* of the flexible printed wiring board **10**A. Hence, (the outer edges **11***d*) of the base layer **11** can be protected by the outer edge portions **10***d* (in the present embodiment, for example, by the covering layers **17** and the adhesive layers **18**) other than the base layer **11**. Thus, the outer edge portions **10***d* are an example of protective portions.

[0053] Meanwhile, at the intervals in between the adjacent openings **16** at which the available area (the extended portions **11***f* and the curved portion **11***g*) is attached to the redundant area **11***h,* the second cutting lines CL**2** are positioned outside of the outer edges **11***d* of the base layer **11** within the area in which the openings **16** are formed. That results in the formation of projections **11***e,* which protrude outward from the outer edges **11***d*. Thus, the projections **11***e* are formed by keeping connecting portions (attaching portions) at which the available area (the extended portions **11***f* and the curved portion **11***g*) is attached to the redundant area **11***h*. That makes it easier to position the base layer **11** at S**15** and S**16** described above. Meanwhile, at the portions at which the projections **11***e* are formed, the base layer **11** gets exposed to the side edges **10***c* of the flexible printed wiring board **10**A. Hence, if the base layer **11** is made of a material such as prepreg having a comparatively lower degree of toughness; then, at the portions at which the projections **11***e* are formed, the strength of the flexible printed wiring board **10**A decreases as compared to the portions at which the outer edges **11***d* recede more than the side edges **10***c*. By taking this point into consideration, in the first embodiment, the projections **11***e* are formed at end portions P**1** in an extending direction of the extended portions **11***f* of the base layer **11** and formed at end portions P**2** in a circumferential direction of the curved portion **11***g*. When the flexible printed wiring board **10**A is bent, the bending stress may be concentrated at the intermediate portion (central portion) in the extending direction of the extended portions **11***f* or at the intermediate portion (central portion) in the circumferential direction of the curved portion **11***g*. For that reason, the projections **11***e* are formed at the end portions P**1** and P**2**, which are not the intermediate portions. Hence, as compared to a case when the projections **11***e* are formed at the intermediate portions at which the bending stress gets concentrated, the flexible printed wiring board **10**A can have enhanced strength.

[0054] As described above in the first embodiment, in the flexible printed wiring board **10**A, the covering layers **17** and the adhesive layers **18** serve as the protective layers, which cover the base layer **11** and the conductive layers **12** and **14** and which have the outer edge portions **10***d* thereof positioned outside of the outer edges **11***d* as the periphery portions of the base layer **11**. As a result, the flexible printed wiring board **10**A can be manufactured to be damage-resistant.

[0055] Moreover, in the first embodiment, on the base layer **11** are formed the projections **11***e,* which protrude outward from the outer edges **11***d* serving as the periphery portions of the base layer **11** and which extend up to the outer edge of the covering layers **17**. Such projections **11***e* make it easier to manufacture the flexible printed wiring board **10**A.

[0056] Furthermore, in the first embodiment, the projections **11***e* are formed at the end portions P**1** in the extending direction of the extended portions **11***f,* and also formed at the end portions P**2** in the circumferential direction of the curved portion **11***g*. Thus, the projections **11***e* are formed at such positions at which the bending stress does not get concentrated. By forming such projections **11***e,* decrease in strength of the flexible printed wiring board **10**A can be prevented.

[0057] Moreover, in the flexible printed wiring board **10**A according to the first embodiment, each of the adhesive layers **18** is formed between the base layer **11** and one of the covering layers **17** to bond the covering layers **17** to the base layer

11. Thus, as compared to a case when the adhesive layers **18** are not formed, the flexible printed wiring board **10**A can be manufactured to be damage-resistant.

[0058] Furthermore, in the flexible printed wiring board **10**A according to the first embodiment, two covering layers **17** are formed, of which one covering layer **17** serves as the first protective layer for covering the first surface **11***a* of the base layer **11** and the other covering layer **17** serves as the second protective layer for covering the second surface **11***b* of the base layer **11**. The outer edge portions of the two covering layers **17** are joined at the outer edge portions **10***d* of the flexible printed wiring board **10**A. As a result, the flexible printed wiring board **10**A can be manufactured to be damage-resistant. Besides, in the first embodiment, the adhesive layers **18** are formed to enable bonding of the covering layers **17**, which serve as the first protective layer and the second protective layer. Hence, the flexible printed wiring board **10**A can be manufactured to be even more damage-resistant.

[0059] In FIG. **16** is illustrated a flexible printed wiring board **10**B (**10**) according to a modification of the first embodiment. The flexible printed wiring board **10**B can be substituted for the flexible printed wiring board **10**A described in the first embodiment. In the flexible printed wiring board **10**B, in place of forming the conductive portions **15***a* (see FIG. **15**) by plating, the through hole **13** formed in the base layer **11** is filled with an electrical conductor such as a conductive paste **22** by processing other than plating. In such a configuration too, it is possible to achieve the same advantages as described in the first embodiment.

[0060] Meanwhile, the abovementioned flexible printed wiring board **10** can also be disposed in an electronic device **100** illustrated in FIG. **17**. The electronic device **100** is configured to be a notebook-sized personal computer comprising a rectangular and flat first main body **102** and a rectangular and flat second main body **103**. The first main body **102** and the second main body **103** are connected via a joint **104** in a relatively rotatable manner around a rotary shaft Ax between an open state illustrated in FIG. **17** and a folded state (not illustrated).

[0061] In the first main body **102**; a keyboard **105**, a pointing device **107**, and click buttons **108** functioning as input receiver are arranged in an exposed manner on a front face **102***b* that is the external face of a housing **102***a* (a first housing). Similarly, in the second main body **103**; a display **106**, which is a display device such as a liquid crystal display (LCD), is arranged in an exposed manner on a front face **103***b* that is the external face of a housing **103***a* (a second housing). In the open state of the electronic device **100** illustrated in FIG. **17**; the keyboard **105**, the display **106**, the pointing device **107**, and the click buttons **108** lie in an exposed condition. In such open state, the user is able to perform operations. In contrast, in the folded state (not illustrated) of the electronic device **100**; the front faces **102***b* and **103***b* face each other from up close in such a way that the keyboard **105**, the display **106**, the pointing device **107**, and the click buttons **108** are hidden by the housings **102***a* and **103***a*.

[0062] The housing **102***a* of the first main body **102** houses components such as the circuit boards **7**, a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), a board assembly having other components mounted thereon, a hard disk, and a cooling fan (no component is illustrated). To the circuit boards **7** is electrically-connected the flexible printed wiring board **10** (not illustrated in FIG. **17**) according to the first embodiment or the modification example thereof. Since the electronic device **100** according to the second embodiment comprises the flexible printed wiring board **10**, it is possible to achieve the same advantages as described in the first embodiment or the modification example thereof.

[0063] Herein, although the embodiments and the modification are described for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the basic teaching herein set forth. For example, apart from the electronic device described above, the embodiments and the modification are also applicable to other electronic devices comprising a flexible printed wiring board. Besides, the constituent elements illustrated in the drawings are merely conceptual, and need not be physically configured as illustrated. The constituent elements, as a whole or in part, can be separated or integrated either functionally or physically based on various types of loads or use conditions. Moreover, apart from the belt-like shape, the flexible printed wiring board can also be manufactured in other shapes. Furthermore, instead of the covering layers and the protective layers, other members can be disposed as the protective portions. For example, on the outer edge portions of the base layer, members of a material having a higher degree of toughness than the base layer (e.g., tapes or films made of a synthetic resin material such as polyimide or polyethylene terephthalate) can be disposed (pasted or attached) as the protective portions. Meanwhile, regarding the television receiver, the electronic device, the housing, the circuit board, the flexible printed wiring board, the base layer, the conductive layers, the protective layers, the conductive portions, the outer edge portions, the projections, the extended portions, the curved portion, the adhesive layers, the first protective layer, the second protective layer, the portions on the outside of the outer edge portions of the base layer, the protective layers having a higher degree of toughness than the base layer, the covering layers, the protective portions, and the terminal; the specifications (structure, type, direction, shape, size, length, width, thickness, number, arrangement, position, material, etc.) can be suitably modified.

[0064] In this way, according to embodiments and modifications, a television receiver and an electronic device comprising a damage-resistant flexible printed wiring board can be provided.

[0065] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

What is claimed is:

1. A television receiver comprising:

a housing;

a circuit board in the housing; and

a flexible printed wiring board configured to be electrically connected to the circuit board and comprising:

a base layer comprising a first surface and a second surface positioned on an opposite side of the first surface;

a conductive layer provided on at least the first surface or the second surface of the base layer; and

a protective layer configured to cover the base layer and the conductive layer, and comprising an outer edge portion positioned on an outside of a peripheral portion of the base layer.

2. The television receiver of claim **1**, wherein the base layer is made of prepreg.

3. The television receiver of claim **1**, wherein the base layer comprises a projection configured to protrude outward from the periphery portion of the base layer and extend to an outer edge of the protective layer.

4. The television receiver of claim **3**, wherein

the base layer comprises an extended portion configured to extend in a direction along the first surface and the second surface, and

the projection is at an end in an extending direction of the extended portion.

5. The television receiver of claim **3**, wherein

the base layer comprises a curved portion configured to curve along the first surface and the second surface, and

the projection is positioned at an end in a circumferential direction of the curved portion.

6. The television receiver of claim **1**, wherein the flexible printed wiring board comprises an adhesive layer positioned between the base layer and the protective layer so as to bond the base layer and the protective layer to each other.

7. The television receiver of claim **1**, wherein,

the protective layer comprises a first protective layer configured to cover the first surface of the base layer and a second protective layer configured to cover the second surface of the base layer, and

a first outer edge portion of the first protective layer and a second outer edge portion of the second protective layer are bonded to each other.

8. The television receiver of claim **7**, wherein

the flexible printed wiring board comprises an adhesive layer positioned between the base layer and at least one of the first protective layer and the second protective layer, and

the first protective layer and the second protective layer are bonded to each other by the adhesive layer.

9. An electronic device comprising:

a housing;

a circuit board in the housing; and

a flexible printed wiring board configured to be electrically connected to the circuit board and comprises:

a base layer comprising a first surface and a second surface positioned on an opposite side of the first surface;

a conductive layer provided on at least the first surface or the second surface of the base layer; and

a protective layer with a higher toughness than that of the base layer, the protective layer being configured to cover the base layer and the conductive layer, the protective layer comprising a portion positioned on an outside of a peripheral portion of the base layer.

10. An electronic device comprising:

a housing;

a base layer comprising a first surface and a second surface positioned on an opposite side of the first surface;

a conductive layer provided on at least the first surface or the second surface of the base layer;

a covering layer configured to cover at least the conductive layer; and

a protective portion integral with the base layer and positioned on an outside of a peripheral portion of the base layer.

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